

## **Experimental floods in the Alps – reintroducing elements of disturbance in regulated hydrological landscapes**

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Freshwater ecosystems across the world are facing the pressure of multiple stressors, undergoing alarming ecological degradation. This holds true particularly for Alpine rivers. The exploitation of hydropower potential of these rivers has substantially altered their natural flow and sediment regimes, considerably contributing to habitat degradation and biodiversity loss in fluvial networks. These alterations modify the physical habitat template of a river downstream of a dam by reducing flow-generated disturbance. Pulse disturbance by natural floods is a key driver of temporal change in freshwater ecological communities, adjusting the equilibrium between physical habitat, resources and biota. Aquatic and riparian organisms have evolved flood-adaptation strategies, and frequency and magnitude of floods shape community organization. Adaptive dam management can make use of experimental floods to restore seasonal peak flows and reintroduce elements of natural disturbance associated with discharge variability. This is what happened on the Spöl River, (Graubünden, Switzerland), where an unprecedented, two-decadal large scale flow manipulation experiment took place. This study will present results from the continuous monitoring of ecosystem responses to repeated experimental floods in the Spöl. These regular flow releases allowed a gradual shift from disturbance-prone to alpine-like macroinvertebrate assemblage by introducing disturbance and enhancing physical habitat conditions, increasing ecosystem resilience to disturbance. Some events occurred in the years (i.e. fine sediments spill, 3 years of flood discontinuation) allow us to elucidate the importance of floods for maintaining the integrity of the river, and to estimate patterns and rates of ecological transition driven by flow disturbance or by flow stability.